

Enhanced Damage Tolerance High Temperature Composite Using a Biomimetic Toughening System, Phase I

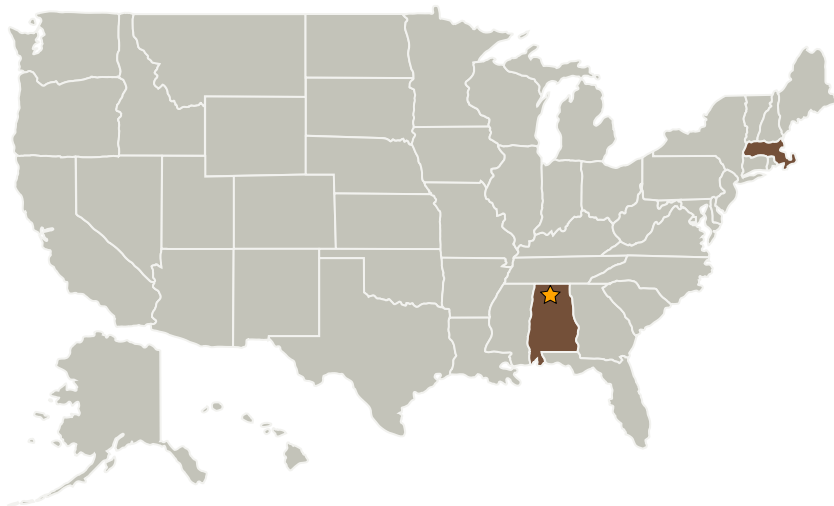
Completed Technology Project (2006 - 2006)



Project Introduction

Lightweight composite structures are required to provide space vehicles with increased thrust-to-weight ratio and durability. New methods for toughening composites that also add functionality, such as making high temperature structural composites more thermally and electrically conductive, can increase spacecraft performance. Infoscitex proposes to enhance toughness of a thermal-oxidatively stable structural composite by more than 50 percent (measured by G1C) by depositing dispersed carbon nanofibers within insulating, resin-rich, interlaminar regions. Our approach also increases z-direction thermal and electrical conductivity, enabling dissipation of heat and electrical charge from hot spacecraft power supply and propulsion enclosures. In Phase I, we will process commercial carbon nanofibers and high temperature composite prepreg into nanofiber-toughened and control composite test panels using an autoclave. Cured composite test panels will be tested for G1C, open hole tensile and short beam shear strength, thermal and electrical conductivity and failure analysis to demonstrate feasibility. In Phase II, we will refine the composite toughening process and materials, conduct compression-after-impact tests, scale-up and produce a prototype multifunctional composite spacecraft structure for testing. Our team includes commercial prepreg and carbon nanofiber suppliers, a space vehicle structure manufacturer and experts in high temperature composite processing.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Infoscitex Corporation	Supporting Organization	Industry	Waltham, Massachusetts

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.2 Structures
 - └ TX12.2.5 Innovative, Multifunctional Concepts